

CLAIMS

1. A method of probing voltage, comprising:
 - a. establishing electrical connectivity between a conductor to be probed and a first terminal of a photoconductive switch,
 - b. during a sampling interval n , applying a laser pulse to the photoconductive switch while applying a voltage to a second terminal of the photoconductive switch corresponding to a voltage sample taken during a prior sampling interval $n-1$, such that current flow through the photoconductive switch is dependent on any difference between voltage of the conductor and the applied voltage,
 - c. converting the current flow to a voltage signal,
 - d. passing the voltage signal during a gating interval T_{elec} , and
 - e. sampling the passed voltage signal to produce a voltage sample for the sampling interval n .
2. The method of claim 1, further comprising the steps of applying a repetitive test pattern to the conductor and synchronizing the sampling interval with the repetitive test pattern.
3. The method of claim 1, wherein the conversion of the current flow to a voltage signal comprises applying the current flow to a current-to-voltage converter having a rise time which is less than the gating interval T_{elec} .
4. The method of claim 1 wherein the voltage signal is passed only during the gating interval T_{elec} so that the voltage sample is insensitive to any leakage through the photoconductive switch outside of the gating interval T_{elec} .

5. The method of claim 1 wherein passing the voltage signal during a gating interval comprises applying the voltage signal to a first transistor Q1 of a differential pair of transistors Q1, Q2, applying a reference voltage to a second transistor Q2 of the differential pair of transistors, and controlling common emitter current of the differential pair of transistors with an electronic switch so as to pass the voltage signal when the electronic switch is closed.
6. The method of claim 1, wherein sampling the voltage signal comprises applying the voltage signal to an analog-to-digital converter and enabling the analog-to-digital converter to prepare a digital sample of the voltage signal representing voltage on the conductor.
7. Apparatus for probing voltage on a conductor, comprising:
- a. a photoconductive switch responsive to laser pulses and having a first terminal and a second terminal,
 - b. a probe tip for establishing electrical connectivity between a conductor to be probed and the first terminal,
 - c. a source for applying a laser pulse to the photoconductive switch during a sampling interval n ,
 - d. a circuit for applying to the second terminal during the sampling interval n a voltage corresponding to a voltage sample taken during a prior sampling interval $n-1$, such that current flow through the photoconductive switch is dependent on any difference between voltage of the conductor and the applied voltage,
 - e. a current-to-voltage converter for converting the current flow to a voltage signal,
 - f. a gate for passing the voltage signal during a gating interval T_{elec} , and
 - g. a sampling circuit for sampling the voltage signal passed by the gate to produce a voltage sample for the sampling interval n .

8. The apparatus of claim 7, further comprising a timing circuit for synchronizing the sampling interval with a repetitive signal pattern appearing on the conductor.
- 5 9. The apparatus of claim 7, wherein the current-to-voltage converter has a rise time which is less than the gating interval T_{elec} .
- 10 10. The apparatus of claim 7, wherein the gate passes the voltage signal only during the gating interval T_{elec} so that the voltage sample is insensitive to leakage through the photoconductive switch outside of the gating interval T_{elec} .
- 15 11. The apparatus of claim 7, wherein the gate comprises a differential pair of transistors Q1, Q2, the voltage signal being applied to a first transistor Q1 of the differential pair and a reference voltage being applied to a second transistor Q2 of the differential pair, and the differential pair having common emitter current controlled by an electronic switch so as to pass the voltage signal when the electronic switch is closed.
- 20 12. The apparatus of claim 7, wherein the sampling circuit comprises an analog-to-digital converter for preparing a digital sample of the voltage signal representing voltage on the conductor.
- 25 13. The apparatus of claim 7, wherein the current-to-voltage converter has an input coupled to receive current flow from the photo-conduction switch terminal via a DC-blocking capacitor.